



TITLE:

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A Load-share System Configuration for Distance Learning

— In Case of Economics Department of Kyoto University —

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and Yoshio MIYAZAKI****

Abstract

Current state of video network server technologies has made it possible to construct an efficient and effective system of distance learning with separate video servers for intranet use and for internet use. Kyoto University implemented this spring such a load-share system of distance learning in the ATM-LAN (622 M bps) campus networks, and one room in the clock tower main building, for instance, can broadcast live lectures to other classrooms on campus at 75 M bps with Panasonic's VideoShower and over to remote internet clients at 28 K bps with Xing's StreamWorks.

Special and delicate care should be taken of manipulation of multimedia devices necessary for distance learning since a teacher is the only operator of them in a classroom. All operations are carried out on a touch panel, except for physical positioning of objects on an overhead camera, loading/ejecting video tapes in a video

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tape player, and rotating each of 3 video movie cameras on the ceiling with a joystick.

I Communication Technologies for Distance Learning

The essence of distance learning lies in interactive visual communication. The simple and expensive way to realize it is the use of ISDN or leased digital lines with the H261 protocol as seen in TV conference held between the head office and its remote branches.

The most costly and powerful one is the use of communication satellites such as SCS (the space collaboration system) with about 70 universities as its participants in Japan. SCS started in October 1996 with 37 national institutions and its membership has increased to 73 academic institutions as of August 1997 (for more detail, see www.nime.ac.jp).

The least expensive, most popular and open method is the use of internet and/or intranet lines with the TCP/IP protocol. The most popular and widely adopted video network server of this type is Xing's StreamWorks.

II Relevant Internet Technologies to Distance Learning

Much attention should be paid to internet or intranet lines with the TCP/IP protocol for communication of distance learning in terms of costliness and accessibility. And many of the universities, national or private, have recently expanded their campus LAN with 10 M bps to ATM-LAN with 155 M bps. This trend has been widening the gap in transmission speed between Internet and intranet LAN.

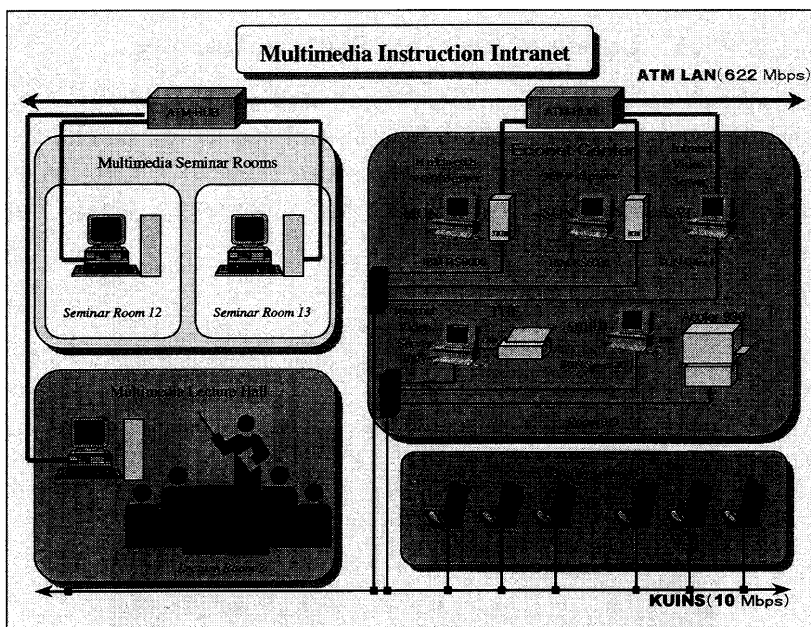
Video network server technologies in internet and intranet environments have been in remarkable progress and attracted much attention among those who are eager to apply them to distance learning in academic institutions. StreamWorks, VDOLive, IP/TV etc. belong to internet video servers, and MediaCenter, StarWorks, VideoShower, etc. to intranet video server.

III A Load-share System of Distance Learning

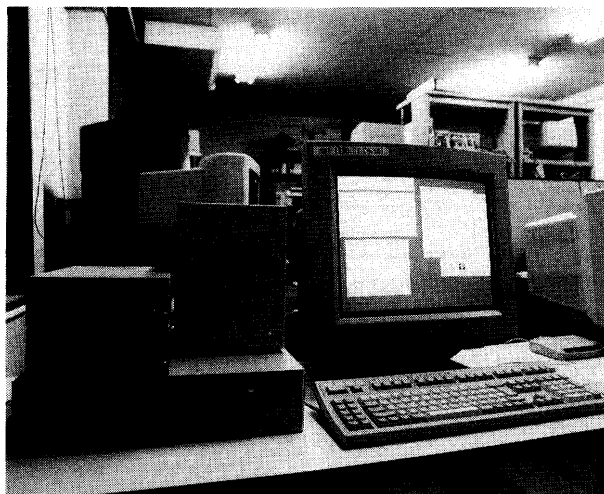
Two types of video network server technologies can be best used to construct an efficient and effective system of distance learning with separate video servers for intranet use and for internet use, which we shall call a load-share video network server system.

The Department of Economics, Kyoto University, implemented this spring such a load-share system of distance learning in the ATM-LAN campus networks, and Room 2 in the clock tower main building, for instance, can broadcast live lectures to other classrooms on campus at 75 mega bps with Panasonic's VideoShower and over to remote internet clients at 28 kilo or more bps with Xing's StreamWorks.

The video network server, VideoShower, is installed Sun Ultra I and is based

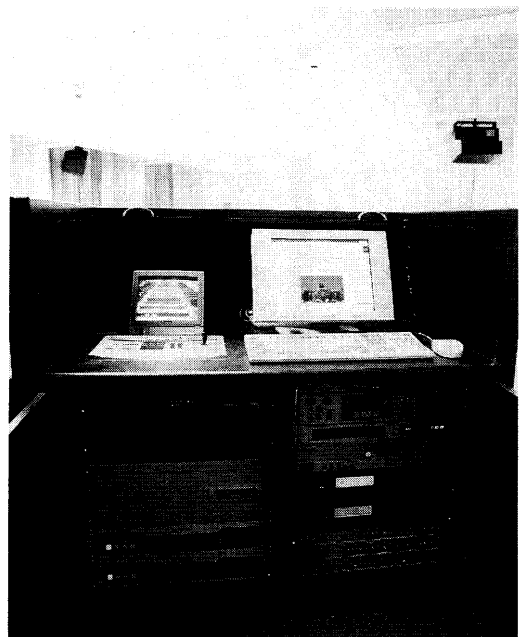
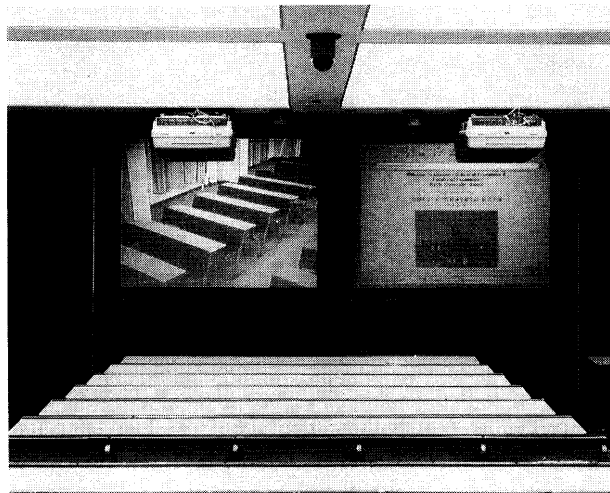


on the video NFS capable of controlling the transmission speed of video data over the ATM-LAN so as to guarantee smooth video playback on the client PCs. It expands the functions of conventional NFS by adding transmission speed control, accommodating 256 KB block-sized files, and speeding up TCP/IP protocol header processing.



IV Layout of Room for Distance Learning

There are two 110-inch white powder-bead wall screens side by side with two sets of two white boards in front. White boards pull down into the closet when wall screens are in use. On the ceiling hang two video projectors, four speakers, three dome-shaped video cameras, and two 21-inch color monitors. Up to four wireless microphones can be used simultaneously.



In the operation cabinet desk, a overhead camera, a video tape recorder, a VideoShower realtime encoder PC, a StreamWorks encoder, a touch panel PC, a video camera controller with a joystick, and two LED color displays monitoring two wall screens are all together packed.

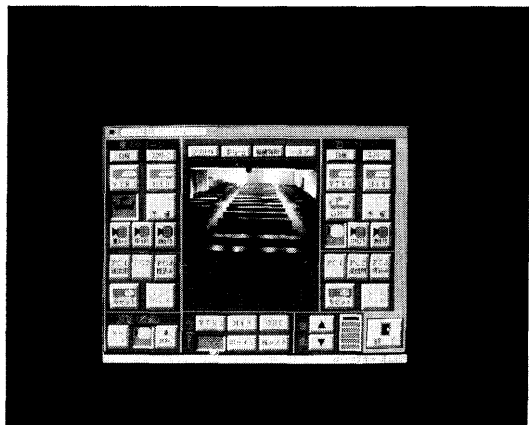
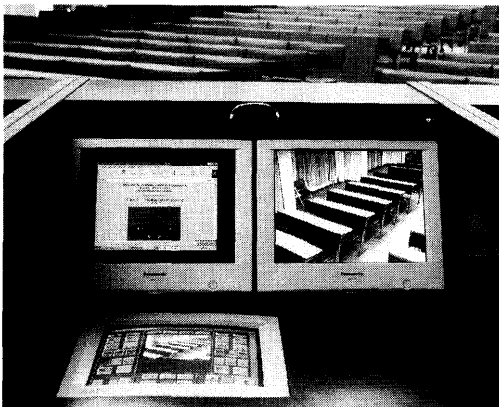
V Easy Touch Panel Operation

Special and delicate care should be taken of manipulation of multimedia devices necessary for distance learning since a teacher is the only operator of them in a classroom.

Firstly, there are only three power switches—main, VideoShower encoder, and overhead camera.

Secondly, all operations are carried out on a touch panel, except for physical positioning of objects on an overhead camera, loading/ejecting video tapes in a video tape player, and rotating each of 3 video movie cameras on the ceiling with a joystick.

Thirdly, you may choose either the center video camera on the ceiling or the wall screen on the right-hand side for broadcasting/sending with the sounds of the two front speakers while the wall screen on the left-hand side and the two back speakers are for receiving.



Lastly, two 10Base-T outlets are available to your notebook brought in for presentation.

VI Conclusion

Taking into account the big difference in transmission speed between internet and intranet lines a load-share system for distance learning was built this spring at the Department of Economics and has proved to be of practical use. Especially, the

video network server adopted worked very well in full screen over the campus ATM-LAN.

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